REMARKS

The Official Action mailed November 8, 2007 has been carefully considered. Reconsideration and allowance of the subject application, as amended, are respectfully requested.

35 U.S.C. §103

Claims 1, 3, 5-7, 9-13, 16-18, 56, 58, 60-62 and 64-66 were rejected under 35 U.S.C. §103(a) as being unpatentable over Sano et al. (A. Sano, Y. Miyamoto, T. Kataoka, H. Kawakami and K. Hagimoto, "10/Gbit/s, 300km repeaterless transmission with SBS suppression by the use of the RZ format", Electron. Lett. Vol. 30, 1994, pages 1694-1695, hereinafter "Sano") combined with Schaffner et al. (U.S. Patent No. 5,291,565) and Ennser et al. (K. Ennser and K. Peterman, "Analysis of RZ- vs. NRZ- transmission on standard single-mode fibers", 1995 Lasers and Electro-Optics Society Annual Meeting, IEEE Conference Proceedings, Vol. 2, October 1995, Pages 357-358, hereinafter "Ennser").

The Official Action correctly acknowledges that Sano "does not specifically disclose that the system comprising (sic) an amplitude adjustment mechanism configured for selectively adjusting a depth of said periodic modulation of the intensity of said optical signal." *Official Action dated November 8, 2007, ¶ 2, pages 2-3.* It is argued, however, that Schaffner teaches use of an optical intensity modulator configured to adjust modulation depth, and that "Ennser discloses to adjust the modulation depth (fig. 1 shows the optimized performance at different rates for duty ratios of 1, 0.75, 0.5 and 0.25)." *Official Action dated November 8, 2007, ¶ 2, page 3.* Applicant respectfully traverses this rejection.

Independent claim 1, recites

> 1. An apparatus for transmitting an optical signal comprising:
> an optical signal source configured to generate an optical signal;

a data modulator coupled to said optical signal source and configured to modulate data on said optical signal at a data modulation frequency; and

an amplitude modulator coupled to said optical signal source and configured to provide a periodic modulation of the intensity of said optical signal; and

an amplitude adjustment mechanism configured for selectively adjusting a depth of said periodic modulation of the intensity of said optical signal.

Independent claim 56 recites:

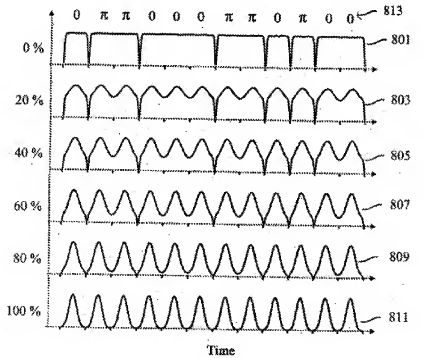
56. A method of modulating an optical signal for transmission on an optical communication system, said method comprising:

modulating data on said optical signal at a data modulation frequency; and

imparting a periodic amplitude modulation on said optical signal; and

selectively adjusting a depth of said periodic amplitude modulation.

One example of a system consistent with claim 1 is illustrated in FIG. 2 and may be described in connection with FIG. 8, a portion of which is reproduced below:



In general, the claimed "data modulator" modulates data on an optical signal, e.g. in a DPSK format as illustrated in the top portion of FIG. 8 labeled "0%." The claimed "amplitude modulator" imparts a periodic modulation on the optical signal, e.g. as illustrated in the remaining portions of FIG. 8. A separate "amplitude adjustment mechanism" is "configured for ***selectively adjusting a depth*** **of said** ***periodic modulation*** of the intensity of said optical signal." FIG. 8 illustrates operation of the "amplitude adjustment mechanism" in adjusting modulation depth to 20%, 40%, 60% 80% and 100%.

Providing an "amplitude adjustment mechanism" configured for selectively adjusting a depth of said periodic modulation" allows for adjustment of the modulation depth to optimize system performance. FIG. 5 of the present disclosure, for example, is a plot of average Q factor vs. modulation depth for an exemplary system consistent with claims 1 and 56, and is reproduced below:

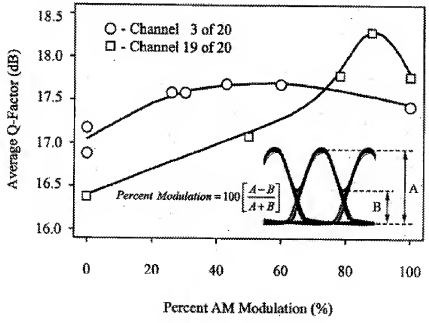


FIG. 5

As shown in FIG. 5, for example, channel 19 of 20 may exhibit a maximum Q-factor at a modulation depth of about 90%, whereas channel 3 of 20 may exhibit a maximum Q-

factor at a modulation depth of about 40%. Allowing selective adjustment of the amplitude modulation depth facilitates setting the modulation to achieve a desired performance, e.g. maximum Q-factor.

There is simply nothing in any of the cited references that teaches or suggests to an "amplitude adjustment mechanism configured for ***selectively adjusting a depth*** of said ***periodic modulation*** of the intensity of said optical signal" (independent claims 1) or "***selectively adjusting a depth*** of said ***periodic amplitude modulation***" (independent claim 56). Again, the Official Action correctly concedes that this aspect of claim 1 is not shown in Sano. Schaffner is cited only for the proposition that a modulator can be configured to adjust modulation depth.

The Official Action argues that Ennser discloses to "adjust modulation depth" by showing performance at different ***duty ratios***. *Official Action dated November 8, 2007, ¶ 2, page 3.* Clearly, however, Ennser is directed solely to evaluation of pure RZ and NRZ modulation formats. *See e.g. "Introduction", second paragraph, page 357.* In Ennser, a continuous-wave laser is externally modulated to impart a pseudo-random data sequence onto an optical signal. For the RZ format, the data is modulated onto the optical signal with a defined duty ratio for the RZ signal. In particular, "For the ***RZ-modulation format***, the full width of the initial pulses at half maximum (T_{FWHM}) represents a fraction of the time of the bit period T_B, whereby a duty ratio τ is defined as T_{FWHM}/T_B." *See e.g. "Model", second paragraph, page 357.* Ennser describes transmission performance when data is modulated using a pure RZ format having different duty ratios, i.e. $\tau = 0.25$, 0.5, 0.75 and 1. *See e.g., "Results and Discussion", first paragraph, page 357.* A duty of ratio of 1 is described in Ennser as a NRZ-pulse. *Id.*

Thus, Ennser simply describes imparting an RZ data modulation having a specific duty ratio. The duty ratio is thus ***a feature of the RZ data modulation format*** applied to the optical signal by the ***data modulator***. There is nothing in Ennser that teaches or suggests use of:

1. ***in addition to a data modulator***, an "amplitude modulator" for imparting a "***periodic modulation of the intensity of said optical signal***";
2. "selectively adjusting ***a depth*** of said ***periodic modulation*** of the intensity of said optical signal"; or
3. an ***amplitude adjustment mechanism*** for performing such a selective adjustment.

In fact, Ennser devoid of anything that teaches or suggests a "***periodic modulation***" in addition to a data modulation or any mechanism for selectively adjusting the modulation depth of the "***periodic modulation.***" Again, the Official Action concedes that Sano does not teach the claimed "adjustment mechanism", and Schaffner does not teach, and is not cited as teaching, the claimed "adjustment mechanism."

Clearly, therefore, the combination of references fails to teach or suggest all the limitations of independent claims 1 and 56. There is no combination of these references that one could make to achieve the claimed invention. The claimed invention could not, therefore, have been obvious from the cited references at the time it was made.

Even if the references could be combined to achieve the claimed invention, the Official Action states only that "It would have been obvious for one or ordinary skill in the art at the time when the invention was made to configure the intensity modulation of Sano to adjust the modulation depth, as it is disclosed by Ennser." *Official Action dated November 8, 2007, ¶ 2, page 3.* Again, Ennser teaches a specific modulation format, not a periodic modulation imparted in addition to a data modulation and an amplitude adjustment mechanism for adjusting the depth of the periodic modulation, as claimed. The Official Action sets forth no actual evidence or knowledge that would have motivated one of ordinary skill in the art to modify Sano with the RZ modulation format of Ennser to achieve the claimed amplitude adjustment mechanism for "selectively adjusting ***a depth*** of said ***periodic modulation*** of the intensity of said optical signal." It is respectfully submitted, therefore, that the Official Action fails to set forth a *prima facia* case of obviousness.

Moreover, the "Conclusion" of both Sano and Ennser is that the RZ format is superior to NRZ. *See Sano, page 1695 and Ennser page 358.* Considering that both Sano and Ennser extol the virtues of the RZ format, the teachings of these references would have led one of ordinary skill in the art ***away from the claimed invention***, which is essentially a tradeoff between RZ and NRZ modulation formats. This tradeoff and the attendant advantages are specifically discussed in the specification at page, 8, lines 12-23:

> The waveforms generated by a system consistent with the present invention may not conveniently fit the definition of any conventional modulation format. For example, the waveforms shown in FIG. 2 are not constant in value over contiguous "1" bits and thus ***do not fit the standard definition of the NRZ format***. In addition, since the waveforms do not necessarily return to zero between adjacent bits, they ***do not fit the standard definition of the RZ format***. The waveform generated by a system consistent with the invention may thus provide ***a tradeoff between two regimes in the transmission system***. In the illustrated exemplary waveforms, for example, the energy in the pulses is more concentrated near the center of the bit slot, which is desirable for limiting the amount of ISI, but since the bit almost fills the bit slot, the peak intensity may not be as large as it would be, for example, in a soliton system. In addition, the rise and fall times of the pulses may be reduced, which may lower the amount of chirp induced on the pulse by the fiber's nonlinear index. *(emphasis added). See also, page 17, line 21 to page 18, line 8.*

As shown in FIG. 5, for example, use of a modulation depth of less than 100% in a system consistent with the claimed invention results in a performance ***improvement over the pure RZ formats*** described in Sano and Ennser. Moreover, the format can allow for narrower channel spacing in wavelength division multiplexed (WDM) systems since it can require less bandwidth.

Sano and Ennser mention none of these advantages, and instead advocate use of a pure RZ modulated signal which is ***inferior to*** modulation imparted in a system consistent with the claimed invention, as described for example in connection with FIG. 5. Only through hindsight, after reading the present specification, would one consider modifying the RZ formats of Sano and Ennser to provide a tradeoff between modulation formats

achieved using the claimed invention. Of course, such hindsight analysis cannot be used in support of an obviousness rejection.

For at least the foregoing reasons, Applicants respectfully submit that independent claims 1 and 56 could not have been obvious over Sano combined with Schaffner and Ennser at the time the invention was made. Claims 3, 5-7, 9-13, 16-18, 58, 60-62 and 64-66 depend, either directly or ultimately, from claims 1 or 56, and are allowable over the cited references by virtue of their dependency, as well as for their own recitations. Applicant respectfully requests, therefore, that the rejection of claims 1, 3, 5-7, 9-13, 16-18, 56, 58, 60-62 and 64-66 under 35 U.S.C. §103(a) as being unpatentable over Sano combined with Schaffner and Ennser be withdrawn upon reconsideration.

Claims 14-15 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sano in view of Schaffner and Ennser, and in further view of Applicants admitted prior art. Claims 14-15 depend from claim 1, and are allowable over the cited references by virtue of their dependency, as well as for their own recitations. Applicant respectfully requests, therefore, that the rejection of claims 14-15 under 35 U.S.C. §103(a) as being unpatentable over Sano combined with Schaffner, Ennser and Applicant's admitted prior art be withdrawn upon reconsideration.

Claims 2, 4, 37-45, 57, 59, 74-86 and 88-99 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sano in view of Schaffner, Ennser and Meissner et al. (U.S. Patent No. 5,060,311, hereinafter "Meissner"). Applicant respectfully traverses this rejection.

Independent claim 74 recites:

74. A transmission system comprising:
a transmitter including:
an optical signal source configured to generate an optical signal,
a data modulator coupled to said optical signal source and configured to modulate data on said optical signal at a data modulation frequency, and

an amplitude modulator coupled to said optical signal source and configured to provide a periodic modulation of the intensity of said optical signal;

an amplitude adjustment mechanism configured for selectively adjusting a depth of said periodic modulation of the intensity of said optical signal;

an optical transmission path coupled to said transmitter; and

a receiver coupled to the optical transmission path.

As discussed above with respect to claim 1, there is nothing in any of the cited references that teaches or suggest a system including an "amplitude adjustment mechanism configured for selectively adjusting a depth of said periodic modulation of the intensity of said optical signal." Independent claim 74 includes this specific recitation. Meissner does not provide the missing teachings, and is not cited as providing the missing teachings. Accordingly, for at least the reasons adduced above relative to claim 1, claim 74 could not have been obvious at the time it was made in view of Sano combined with Schaffner, Ennser and Meissner. Claims 2, 4, 37-45, 57, 59, 75-86 and 88-89 depend either directly or ultimately, from claims 1, 56 or 74, and are allowable over the cited references by virtue of their dependency, as well as for their own recitations. Applicant respectfully requests, therefore, that the rejection of claims 2, 4, 37-45, 57, 59, 74-86 and 88-99 under 35 U.S.C. §103(a) as being unpatentable over Sano combined with Schaffner, Ennser and Meissner be withdrawn upon reconsideration.

Claims 20, 22-27 and 69-72 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sano in view of Schaffner, Ennser and Kitajima et al. (U.S. Patent No. 5,515,196, hereinafter "Kitajima"). Claims 20, 22-27 and 69-72 depend from either claim 1 or 56, and are allowable over the cited references by virtue of their dependency, as well as for their own recitations. Applicant respectfully requests, therefore, that the rejection of claims 20, 22-27 and 69-72 under 35 U.S.C. §103(a) as being unpatentable over Sano combined with Schaffner, Ennser and Kitajima be withdrawn upon reconsideration.

Claims 46-50 and 90-98 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sano in view of Schaffner, Ennser, Meissner and Kitajima. Claims 46-50 and 90-98 depend from claims 1, 56 or 74, and are allowable over the cited references by virtue of their dependency, as well as for their own recitations. Applicant respectfully requests, therefore, that the rejection of claims 46-50 and 90-98 under 35 U.S.C. §103(a) as being unpatentable over Sano combined with Schaffner, Ennser, Meissner and Kitajima be withdrawn upon reconsideration.

Claims 21 and 68 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Sano in view of Schaffner, Ennser, Kitajima and Takayama et al. (K. Takayama et al., "An all-optical 10-GHz LD-based clock regenerator using a Mach-Zehnder interferometer-type NRZ-RZ converter", Tech digest of ECOC '91, vol. MoC1-2, pp. 77-80, September 1991, hereinafter "Takayama"). Claims 21 and 68 depend from claims 1 and 56, respectively, and are allowable over the cited references by virtue of their dependency, as well as for their own recitations. Applicant respectfully requests, therefore, that the rejection of claims 21 and 68 under 35 U.S.C. §103(a) as being unpatentable over Sano combined with Schaffner, Ennser, Kitajima and Takayama be withdrawn upon reconsideration.

Having dealt with all the objections raised by the Examiner, it is respectfully submitted that the present application, as amended, is in condition for allowance. Thus, early allowance is earnestly solicited.

If the Examiner desires personal contact for further disposition of this case, the Examiner is invited to call the undersigned Attorney at 603.668.6560.

In the event there are any fees due, please charge them to our Deposit Account No. 50-2121.

Respectfully submitted,

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